802.11 Wireless Ethernet

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Synopsis:

Wireless LAN technology is mature in the form of IEEE standard 802.11. The existing 2 Mbits/sec market is mature, strong, and growing but limited to vertical markets. Prices have remained high, however which is limiting implementations. Faster 11 Mbits/sec devices are coming quickly and may begin to replace wired LANs. Prices should rapidly decline as bigger players get involved in emerging horizontal market.

Summary Facts:

Paradigm:	Ethernet technology made wireless
Prime developers:	1-2 MBPS systems: Lucent, Harris, Symbol, etc. 11 MBPS systems: Cisco, Cabletron
Web Site:	http://stdsbbs.ieee.org/group/802/11 Http://www.wlana.com
Standards:	IEEE 802.11 Wireless Ethernet
Device Cost:	$400 for PC Card ($200 cards just announced) $1,000 Access Point for servers ($700 devices just announced)
Range:	300 meters
Spectrum:	2400 to 2483.5 MHz in the U.S., unlicenced, ISM band.
Output Power:	1 watt max
Technology:	frequency-hopping, spread-spectrum (FHSS) as well as direct-sequence transmissions. Employs Time Division Duplexing (TDD) Slow hope rate (2.5 hops/sec)
IR version:	802.11 standard also applies for 850 -950 nm Infrared links. Uses 16-value pulse-position modulation. Transmission rates of 1Mbits/sec and 2 Mbits/sec supported. IR range is up to about 10 meters with office ceilings as reflectors.
Channels:	79 1-MHz channels
Modulation:	Frequency-Shift keying (FSK) Direct sequence system uses differential binary phase-shift keying (DBPSK modulation for 1Mbits/sec. Differential qudrature shift keying (DQPSK) is used for 2Mbits/sec.

Transmission rate:	802.11 = 2 Mbps -- allows 15 units in close proximity 802.11b = 11 Mbps allows 4 units in close proximity, security? 802.11a = 40 Mbps 5 GHz band, coming
Date types:	Voice & Data supported.
I/O:	USB supported
RFI Issues	Bluetooth & 802.11, cordless phones & even microwave ovens use same 2.4 GHz spectrum. Interference expected to disrupt 802.11, not vis versa because fast hop rate of Bluetooth. Technical solutions being developed and additional frequency spectrum being negiotated. See http://grouper.ieee.org/groups/802/15/pub/TG2.html 802.11 direct sequence high rate devices are very reliable in the presence of Bluetooth transmissions. (Non-hopping) ISM Band is not regulated by FCC
Network Design:	Ethernet
Nodes:	Many Ad hoc peer-to-peer networks possible
Interconnects:	Gateways possible
Security:	Wired equivalent privacy (WEP), a 40-bit seed key and RC4 encryption lgorithm. Only data packet contents are encrypted. Secure registration and authentication also supported.
OS Support:	Microsoft Windows, CE, Palm, etc.
Multimedia	802.11 does not support high-density, real-time multimedia applications but can support voice. A single wireless LAN can support up to four full-duplex, lone-quality voice channels (assuming use of a Point Control Function (PCF)).
Alternate Technologies	Ethernet (CAT-5) Dominant wired LAN technology Bluetooth Designed for short range links HomeRF Home LAN, May become compatible with Bluetooth, Low end version of 802.11 HomePNA Home LAN Powerline Uses home power cabling DECT - Digital European Cordless Telecommunications

Standard	Data rate Mbits/s	Range (meters)	Freq (GHz)	Spec Status	Availability
802.11	2	300	2.4	1999	Now
802.11b	11	100	2.4	Late 1999	Now
802.11a	20 - 40	200 approx	5	Not done	2 years
802.15 BT	<1	10	2.4	1999	2q00
802.15 HI	20+	TBA	2.4/5	Not done	?
HomeRF	1.6	50	2.4	01/99	2q00
HomeRF+	10	50	2.4	Not done	?

Developers: Symbol Technologies, Intel ($100M investment in Symbol)
Lucent Technologies Orinoco product line (for consumers)
Harris Semiconductor
Cisco, Cabletron, Nortel, 3Com, Compaq

Likely Products: PCMCIA Cards for laptops
Built into laptops
Cards for desktops
Barcode Scanners
PDA Connectivity (built-in)
Access Point Adapter (connects LAN to wireless LAN)

Interop: Interoperability is becoming a problem. There is no certified test suite to ensure compatibility.

Issues: All technologies seem to be going after the same market.
Emerging 11-mbits/sec systems may begin to replace wired LANS for some applications. Home market interest is very strong.

Future: 20 Mbits/sec transmission speed using the 5.2 GHz band is coming

Wireless ISP Wireless ISP access points is coming (4/00)
Wayport has installed access points at: Wyndham Hotels, Royal Sonesta in Boston, and the Dallas/Fort Worth Airport.